MONTHLY JOURNAL OF
THE MUSHROOM GROWERS'
ASSOCIATION

MGA BULLETIN

JULY, 1961 · NUMBER 139

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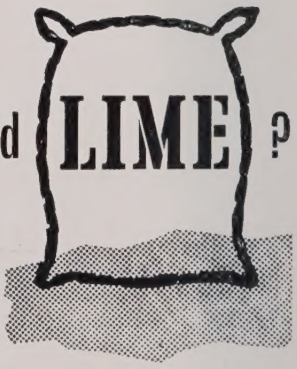

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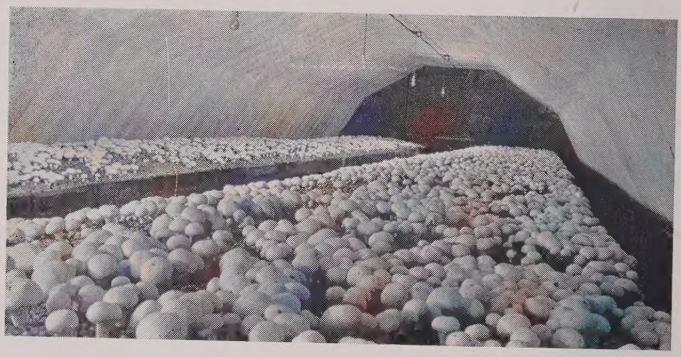

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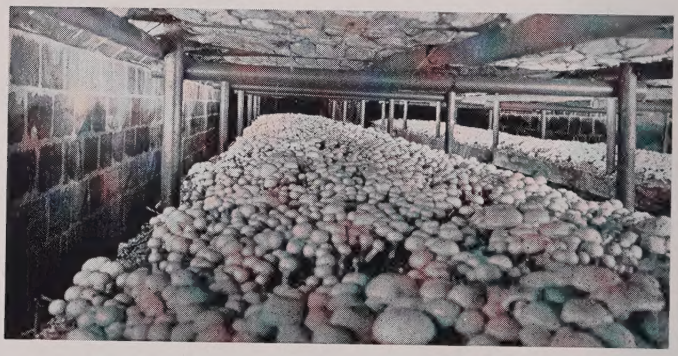

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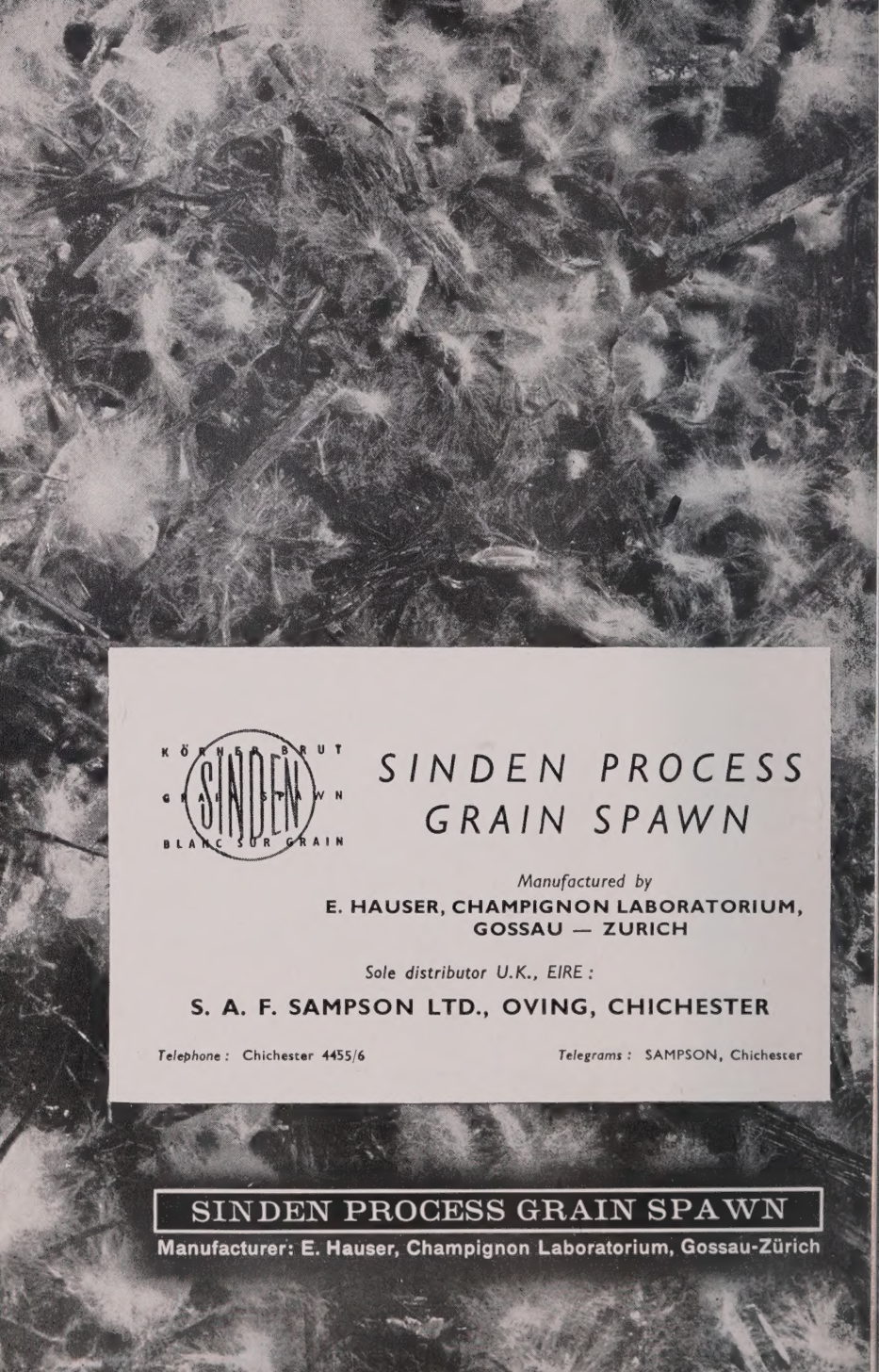

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JULY - 1961
NUMBER 139

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EDITORIAL

THE COMMON MARKET

Topical though discussion on the Common Market may be, it is with some hesitancy that I make this matter the subject of an Editorial, mainly because I, like so many others, find the picture somewhat obscure : with the implications, even more so.

Elsewhere in this issue Herr Hullen, a leading figure in the West German mushroom growing industry welcomes the suggestion that England may soon be in although, judging by the information here, the entire situation is clouded in uncertainty, so much so that informed sections of the population say we should go in, other sections say we should stay out, and Mr. Macmillan, the Prime Minister, suggests that it could well be a matter of *whether we can get in.*

From time to time politicians have made it quite clear that Government, if and when we do join, will insist on safeguards for British agriculture but there seems to have been an ominous silence on horticulture which, most people agree, is likely to be seriously challenged.

What then of the mushroom industry which does not enjoy as much protection as our German counterparts, and which is one of the commodities on the GATT "free" list?

Fortunately, mushroom growers have for years had their eyes on Europe and their ears close to the ground and were aware, long before the Common Market became a real threat, of the need to produce mushrooms as economically as possible.

By and large we are a reasonably efficient industry, apart from marketing, although there is room for improvement. By and large we produce a good quality mushroom and produce it certainly as well, if not better, than most countries. By and large too there is a tendency amongst growers to expand slightly ahead of the existing market.

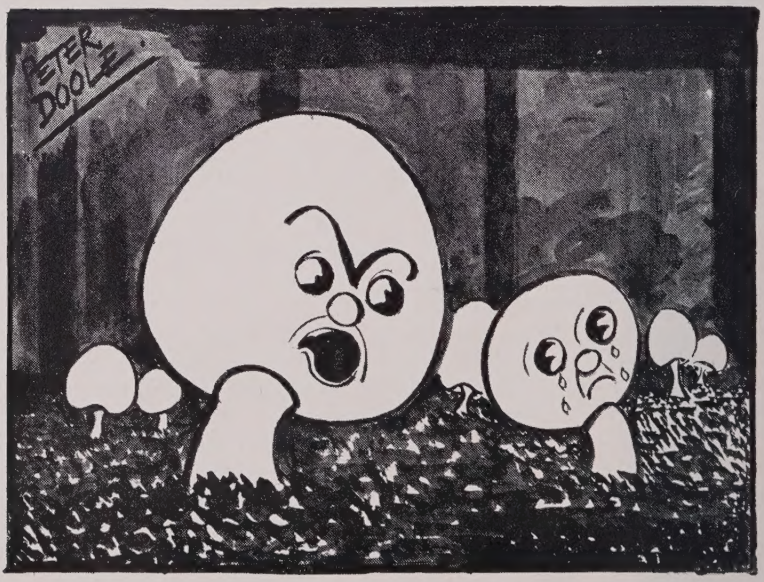
Should we then be afraid of competition from Europe? Are we as an industry bound to suffer from additional competition? Perhaps we shall suffer but at least we have, in my opinion, tried to prepare for whatever trials lie ahead.

In the meantime it is the duty of every horticulturist to see that, if we enter the Common Market, there should be some protection for an already hard-pressed industry; and we ourselves could be hard-pressed, and the situation drastically changed, if say the tomato people found the going too hot and turned their attention to mushrooms.

But the puckish though persists—there could be a steady outflow of refrigerated bulk containers, carrying fresh mushrooms from this country to Europe! WRA

TALKING TURKEY

About forty producers, members of the newly formed Oven-ready Turkey Producers' Association, have agreed to raise £150,000 to publicise oven-ready turkeys over the next 12 months. Members of the Association, representing over 90% of the known 1961 crop of oven-ready birds, have agreed to a publicity levy of 1d. per lb.



. . . . And as you grow up you'll learn that expressions like, 'Can it!', 'In the Soup' and 'Out of the Frying Pan into the Fire', are not used by any mushroom worth its gravy! . . . .

AN INTERVIEW WITH A SINGLE CROPPER

Arthur D. Foster interviewed by

Dr. Edmund B. Lambert[1]

Perhaps for English growers the idea of deliberately setting out to make a leisurely living by raising one crop of mushrooms a year will be so strange that this discussion will seem like an interview with a little purple man from Mars.

In Eastern United States however, labour conditions and market conditions are not too unfavourable for "single croppers". In this area about 150 growers with a total bed space of 3,000,000 square feet grow single crops on shelf beds. During the winter of 1959-60, in one crop, the Foster Mushroom Farms at Glyndon, Maryland, U.S.A. produced 4.6 pounds of mushrooms (with the stems cut off) per square foot on a total of 130,000 square feet. This yield, of course, is exceptionally high for a large growing area and has stimulated considerable interest in the methods used.

The procedures employed were selected by the authors over a period of several years after the usual process of trial and error. Our reasons for preferring them are given in some detail in the interview that follows.

Q.: Arthur, any crop coming from a number of mushroom houses varies considerably. Can you tell me something about the differences in the yields from separate houses in your crop last winter?

A.: The poorest house made 3.6 pounds and the best house 5.3 pounds. Our houses are arranged in blocks of ten with roughly 40,000 square feet in each block. The poorest of these blocks yielded 4.25, the best 4.98, and the third 4.41.

Q.: Can you put your finger on any two or three operations that were primarily responsible for your high yields?

A.: I would like to, but I'm afraid I can't. The way we look at it is that our high yields were due to the accumulative effect of doing many things about right and not being too far off the beam on any one of them. Most of the credit, I believe, should go to Charles Fisher and Ralph Moats, who supervise our growing operations.

Q.: If it is okay with you, I shall ask you about each separate step in the growing process. Let's begin with the compost. Did you use manure or artificial compost? And what supplements did you add?

A.: We used horse manure exclusively. It comes from riding stables and is hauled to our wharf almost the year-round. We have roofs over our storage piles and usually at the time we begin composting, the manure has been stored on the wharf for several months. We added 60 pounds of dried brewers' grains and 40 pounds of gypsum per ton of manure. Half of these materials were added on the second turn and half on the third turn.

Q.: Are you satisfied that this is the best amount of brewers' grains to add to the compost?

[1] Plant Pathologist, Crops Research Division, Agricultural Research Service, United States Department of Agriculture.

A.: No, we are not. We feel there might be room for improvement from adding a little more, especially if we add some of it earlier in the composting period. But we don't intend to change our supplementing in the coming season except in small-scale experiments.

Q.: How about a quick rundown on your composting procedure?

A.: We compost in the standard loaf-of-bread-shaped piles, and the total time of composting after these piles are assembled is usually 11 to 14 days. We water heavily when we make up the pile, as almost everyone else does, and turn 4 times at 3- or 4-day intervals, counting the making up of the pile and watering as the first turning. The compost lies on the wharf an additional 3 or 4 days before we fill. We collect the water that leaches from the piles and spray it back on. It's really rich-looking stuff and we call it " goody-water."

Q.: Do you have any rules about filling that you feel might be interesting?

A.: I might say that we like deep-filled beds and since we are single croppers, we do our best not to be caught in the heat in the fall or in the spring. This means we try to bring on our first mushrooms about 1st December and have all our houses filled by this time. We try to fill the beds with manure having about 70% water content.

Q.: What do you mean by deep-filled beds?

A.: We try to get about all the compost we can into the bed at filling time without touching the crosspieces. After the beds are levelled off, they are usually 9 or 10 inches deep.

Q.: What are some of the high points of your pasteurizing system?

A.: I believe we are following pretty much the same system you use at Beltsville. To save steam, we allow the temperature in the houses to come up of its own accord until the beds are about 130° F. This usually takes 1 day or possibly 2. We then raise the temperature with steam until the air temperature is about 140° and keep it there for 4 hours after the beds reach 140°. If we start steaming in the morning, we usually are finished by mid-afternoon. The temperatures are then allowed to cool or helped to cool by opening vents until the bed temperatures range from 120° to 130°. They are held at this temperature for about ten days or until the pH value drops to somewhere around 7.8. If the compost is excessively wet, it may require 3 or 4 days more.

Q.: Do you ventilate during the pasteurizing process?

A.: Oh yes! We feel that it is very important to ventilate at that time, especially during the " high heat". To insure against a later development of *Chaetomium*, we open up the houses front and back for about 5 minutes every half hour during the high heat. In the lower temperature phase of pasteurizing we usually have the ceiling ventilators cracked and the little ventilation holes open at the front of the houses.

Q.: Do you run fans during pasteurizing in the standard way?

A.: Yes. We run two fans in each house arranged so that they are blowing down towards the floor during the pasteurizing process.

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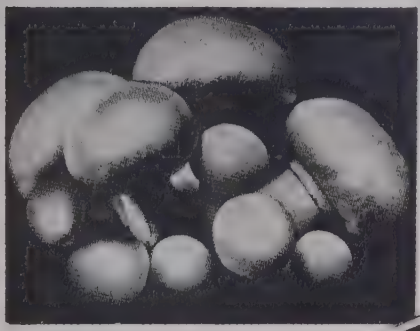

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1	31		32	–	
2	50		33	–	
3	–		34	246	
4	–		35	38	
5	757		36	–	2·80
6	149		37	43	(35
7	388		38	–	
8	–	·83 lb/sq/ft	39	–	
9	224	(7 days)	40	–	
10	–		41	150	
11	–		42	144	
12	–				3·00 lb/sq/ft
13	1158				(42 days)
14	493				
15	–	1·95 lb/sq/ft			
16	281	(14 days)			
17	–				
18	–				
19	122				
20	36				
21	81				
22	144	2·27 lb/sq/ft			
23	45	(21 days)			
24	–				
25	–				
26	–				
27	249				
28	–				
29	–	2·53 lb/sq/ft			
30	169	(28 days)			
31	–				

TOTAL PICK: 4998 lb.

AREA: 1660 sq ft on trays

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Q.: Do you get any " heat moulds " on the beds?

A.: Yes. We usually have a lot of heat mould towards the end of the pasteurizing period.

Q.: How do you handle the spawning? Have you tried the new " shake-up " spawning?

A.: We broadcast the spawn as soon as the beds have come down from the heat and make no attempt to level the beds at that time. We rough in the spawn about $2\frac{1}{2}$ inches deep with a fork and keep the surface of the bed constantly moist with a fog spray after spawning. When the spawn has grown for about 2 weeks, we get in and level the beds. At that time, as a matter of routine we mix the spawn into the bed 4 or 5 inches deep.

Q.: Did you test out the new method of " shaking-up " the beds, to the bottom after the spawn had run for a week or 10 days?

A.: Yes. We tried this in a few houses after coming home from the Copenhagen meetings. These houses looked a little better at first but after 60 days the yields were no better than in the houses handled by our usual " roughing-in " system, which suits us better.

Q.: How about the temperature during the spawn run?

A.: We grow our spawn at about 70° F. for 1 or 2 weeks and then drop the temperatures to 65°. This routine, of course, can't always be followed since the temperature depends somewhat on the weather but we feel that we are minimizing the chances of a hot spell giving us a bad case of Truffles disease by bringing on our first breaks as late as 1st December.

Q.: How about your casing schedule?

A.: We are not in a hurry to case, and we usually do it between 3 and 4 weeks after spawning.

Q.: How do you prepare your casing soil?

A.: We think it is very important to keep our soil fields clean-cultivated for at least 1 year in advance of our need for them. We had a lot of trouble until two years ago with green moulds and I believe a large part of our present success in preventing them is due to having the soil completely free of plant roots and stubble at the time it is sterilised. We gas our soil with chloropicrin in the summer and pile up each truck load in the soil shed immediately after gassing, in the way that we learned from the Leto Brothers. We are very careful not to have our soil too wet or too dry when it is gassed and we spray the surface of the heap in the soil shed with water and cover it with a plastic tarp. We try to lime the soil up to about pH 8.

Q.: Do you gas and store your whole supply of soil in the summer?

A.: Yes, we do.

Q.: Do you cover the beds with the thin layers of limed soil or peat-muck that some other growers use?

A.: Yes. After the first break we put on a very thin layer of a mixture of 1 part of hydrated lime and 15 parts of soil. I learned this

trick from Boyd Gentry and we think it helps slow down green moulds. We also mix peat-muck half and half with soil and scatter a thin layer of this mixture over the beds during the third break.

Q. How do you handle your watering problem?

A.: We make a good deal of use of the fog nozzle until the first pins begin to show on the beds. We fog the beds at spawning time and all through the spawn run and we usually fog the compost just before casing. To avoid puddling, we fog the casing soil instead of using a rosehead until after the first break. After the first break we water gently with a large rosehead. We maintain a good soil moisture at all times and try never to allow any part of the bed to become either dry or puddled. We don't make any attempt to water according to the the rhythm of the flushes. We just keep watering every bed when it seems to need it to keep the soil moist. In our organisation one man, Lacey Bowers, waters the beds in all of our houses. I would like to say again that he makes no attempt to schedule his watering according to the size of the mushrooms on the beds, but he does a wonderful job of keeping the soil moisture about right during every day of the growing season.

Q.: Do you ever use chlorinated water?

A.: We are set up to use chlorinated water but since we have been cropping at lower temperatures, we have not needed to use it except towards the end of the crop.

Q.: How about temperature control?

A.: During the growing period we hold the temperature after the first break as near 52° F. as we can. Of course in the early fall and late spring the temperature may get out of hand.

Q.: How about your ventilators? Do you have any special system of managing them?

A.: As you know, there are hallways in front of all our mushroom houses, and during the past season we ventilated by running fans set in the walls of these hallways so that the air was constantly blowing into the hallways. Each house has two small openings in the corners at the floor level from the hallway into the house. We tried to regulate the air movement into these openings so that the houses were receiving fresh air in the amounts that you recommend, that is, about 10 cubic feet of fresh air per hour for each square foot of bed space. We open the ceiling ventilators at the back end of the houses so as to compel the air to move through the houses and out through the back ceiling ventilators.

Q.: Did you have any trouble with the drying out from this system of ventilation?

A.: No, I wouldn't say we did during most of the season. For a few days in January and February the forced ventilation lowered the temperature in the houses more than we wanted but we were never troubled with excessive drying out of the beds.

Q.: Did you make any attempt to control the rate of air movement over the beds?

A.: No, we didn't. We understand that careful control of the rate of air movement may produce bigger mushrooms at high growing temperatures but doesn't affect the yield. Since we are growing at low temperatures, we get good big mushrooms anyhow so we didn't feel that careful control of air movement was worth the effort for us.

Q.: Do you feel that there was anything worth noting about your system of picking and trashing?

A.: No, we simply trash along with the picking and the worst of the trashing job is over after the third break. Because of our low growing temperature, most of the mushrooms were large and firm after the third break. And we got an excellent cut-out. We picked for as long as $6\frac{1}{2}$ months in some of our houses.

Q.: How about your system of cleaning out after the crop was finished?

A.: We are very thorough in cleaning out and sterilizing the empty houses, but I don't suppose we take more pains here than most growers do. As an extra precaution we steam before emptying the houses and steam with formaldehyde again 4 or 5 days before filling. Before emptying we steamed until the air temperature went up to 150° F. for about 4 hours. When steaming the empty houses we ran 5 gallons of formaldehyde into each single house. Also, after the houses are empty, we spray the boards and the aisles with Fungidex or Elgetol. Last fall we also sprayed the attics when the houses were empty.

Q.: Can you give us a brief rundown on what you do to control animal pests and diseases?

A.: We feel that our growing-rooms are almost free of diseases and pests at the end of the high-heat period. During pasteurizing we screen the doors to keep out flies, and dust towards the end of the pasteurizing period with Lindane. After the crop begins to come on, we dust with Malathion even if we don't see any flies. We also feel it helps keep flies out if the walls around the doors are painted with Diazinon and with DDT. These measures seem to keep us free of animal pests, but I guess it's only because we are lucky that we don't have Cecid fly larvae in our beds.

Q.: Do you have any diseases in your houses? And how do you combat them?

A.: At one time or another I'm sure we've had all the diseases in the books. But during the past few years we've had pretty good luck keeping them under control. Our low-temperature growing system seems to help a great deal to hold down diseases such as *Verticillium* and *Mycogone*. We have an occasional Bubble early in the crop, but by growing at 52° F., we find it is easy to keep ahead of Bubble by spraying with a strong BK solution as soon as it appears. We send a man around nearly every day to locate any new outbreaks and take care of them.

Q.: How about Mummy Disease? I understand you had a few houses with Mummy.

A.: Yes. We had Mummy, I believe, in three houses and these were the only houses that yielded less than 4 pounds per square foot. We didn't do a very good job of preventing the spread of Mummy, and in the coming season we are going to try to trench it out early enough to confine it to local areas.

Q.: This pretty well covers the waterfront. Are there any points that you feel deserve special emphasis?

A.: As I said before, we feel that you can't get good crops if you slip up in many places. We've always done a pretty good job of outdoor composting and don't feel we've improved that process very much in recent years. We think our greatest improvement has come from adjusting our filling schedule to permit low temperature growing, clean cultivation of the soil field, forced ventilation, and keeping the soil continuously moist.

Q.: What are your plans for next season? Do you feel you're going to make 5 pounds?

A.: We wouldn't be mushroom growers if our hopes weren't high. We're going to do everything we can to try to get our whole plant to yield as well as our best houses did last season, but we know that this is what every grower tries to do every year, and I guess our hopes can best be expressed by saying that we have our fingers crossed.

Q.: Do you plan to grow a double crop next year?

A.: No. I'd have to get a total of 6 pounds in 2 crops to equal the net income from 5 pounds in a single crop, and I prefer to try for another big single crop.

NORTHERN GROWERS MEET

Organised by Northern Horticultural Supplies of Bingley, Yorkshire, a " get together " of mushroom growers took place at the Londsborough Arms Hotel, Selby, on 1st June.

A talk on the use of Pepsan was given by Mr. Hugh Claxton of Cheshire who said that Pepsan, mixed with water, was quite suitable for cleaning mushroom trays and the interior of mushroom houses and gave excellent control. He had found this product particularly useful in the removal of unwanted materials from trays and walls. Though recommended for use with hot water, the actual efficiency loss with cold water was only 2% and this could easily be counteracted by adding the extra Pepsan. Mr. Rudd, Technical advisor to B.E.C. (Sales) Ltd., who market the product, afterwards answered a number of questions.

Mr. V. L. Barrow, B.Sc., Managing Director of Shirley Organics Ltd., followed with an interesting talk on the requirements of a modern peak-heat house. The actual construction, with adequate insulation, ventilation and correct air displacement was of the utmost importance. A first-class peak-heat house was a " must " in efficient production.

The concluding speaker was Mr. Atkinson of the Tarpen Engineering Co., Ltd., who explained the efficient use of the Tarpen Hoe Tiller, with its special attachment, for shake-up spawning. A 14" shaft with blade attached made the work quite easy.

Weston-Super-Mare, October, 1960

WHITHER MUSHROOM GROWING?

Robert Patterson, B.Sc. (Agric.)

The future of any industry cannot be assessed without first considering its present state and its immediate past history. From a horticulturist's point of view the last twenty years could be looked upon as the period of the mushroom revolution. The uncertain hole-in-the-corner methods of pre-war days have rapidly given way in two decades to a modern thriving industry valued at something like seven million pounds a year.

During the war years when everything ' mushroomed ' mushroom growers found themselves, many without knowing it, in a kind of fool's paradise. Even for a few years after the war prices remained high and unrealistic. This fact, probably more than anything else, brought many new growers into the industry. Many people released from the armed forces, and with gratuities to spend, were attracted to mushrooms. Some were soon to be a little disillusioned and others stuck it out and became considerably successful. Wartime growers extended their plants and many tomato and rhubarb growers started dabbling in the business. Many of these who were part-time mushroom growers at first switched completely to mushroom growing. Once the price of tomatoes fell many growers left the blackout on their greenhouses with the result that many tomato houses soon became permanent mushroom houses.

This switch to mushroom growing in the post-war years continued rapidly until 1950 when a long period of very low prices put a real brake on expansion. Many of the less efficient growers found it impossible to continue and rather than discard their outmoded methods and buckle in to harder work they withdrew from the fray and in fact it was from then on that the job of mushroom growing became a realistic struggle. The happy and complacent pre-1950 attitude of growers changed to one of troubled determination.

A period of adversity is one of nature's best selectors. When man has to struggle for existence he either puts up a good fight and usually survives or he gives in and passes away. The successful growers in the decade just ended are mostly survivors from the mid-century setback and, having been through real trouble once, they sensibly work and act in the certain knowledge that it could happen again. So if times are reasonably successful they do not gloat or brag about their success. Instead, with one eye on a possible future setback they consolidate their positions and streamline their production programmes

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to the best of their ability. That is why there is less moaning about seasonal gluts than there used to be. The survivors of the 1950 struggle realise that these occasional surpluses are bound to occur and that they will pass as they have done before. It is the year as a whole that counts and this fact is accepted by most other industries. Glut periods can be compared to the ' cheap sale ' periods of large stores when goods are sold at less than cost just simply to get rid of them. It is here that the perishable nature of the mushroom is a sort of mixed blessing. If markets are temporarily overloaded we cannot hold them very successfully for long periods but on the other hand the fact that they are perishable ensures that they are cleared up one way or another in a reasonably short space of time thus leaving the shelves free for further fresh supplies. We have only to look at some of the non-perishable foodstuffs such as potatoes or apples and see what really happens there. If the price of potatoes comes down the grower can hold them safely thinking that the price might go up again but just because he can hold them he is increasing still further the supply, which in the end reduces the price.

The existing pre-1950 growers in their struggle for survival have left no stone unturned in their effort to cut costs and produce better and quicker crops. The official and continuous rise in wages was something the grower could do nothing about but by mechanization he was able to reduce the number of wage earners.

The method of growing was the first to receive attention. A new American idea for solving the difficult growing problems in deep mines and caves was much talked about and many growers thought it could be applied with benefit to their farms. It became known as the tray method of growing and has been the subject of many heated and prolonged discussions in the last fifteen years or so. That is why I do not propose to dwell on it here. As a mushroom grower I was born on shelves just over twenty years ago and as the peculiar layout of the buildings, of the Company with which I am connected, did not lend themselves to working on the tray system the matter never received much serious consideration. For the tray system to be a complete success it is essential that the farm be designed and built with the complete tray method in mind. There are many hybrid progeny of the shelf and tray systems but like most hybrids they can be regarded as scientific curiosities although many of their adherents stick to them with mule-like tenacity.

Composting was the next major item to receive the growers' attention and mechanization of this operation did really reduce labour and costs very considerably. Hand composting rapidly gave way chiefly to the use of the converted manure turner in conjunction with a tractor with its forward loading fork. Two or three men were able by this new method to do as much work as twenty hand operators. Mechanized composting in one form or another has come to stay. The variations in the methods of composting are nearly as numerous as growers themselves and it would be fairly safe to say that no two growers' methods of composting are identical in every detail. This,

together with the tremendous variations in the raw material, make it almost impossible to have two finished composts with the same potential cropping capacity. The inside of a compost stack is largely a closed book and most composting experiments are empirical. If a certain method works well it is adopted and nobody can really say why it works better than some other method. No matter whether the short, long or medium method of composting is used the compost in the trays or shelves will, invariably, be improved by peak heating. Like soil sterilization in a tomato house this puts the finishing touch to the compost before it is called upon to produce a crop of mushrooms. When a correct peak heat has been completed the compost has reached its highest potential cropping point. What the resulting crop will be depends on the thoroughness with which the succeeding processes are carried out.

It is an accepted practice among growers nowadays to use modern pure culture spawn. If either of the newish methods of 'through' or 'shake-up' spawning are proved to increase yields consistently there is no doubt that growers will quickly switch to this idea. Very little of an extra yield will more than pay for the extra spawn and labour required. While science has largely failed to help us very much with our composting process we must admit that she has contributed considerably to the present day success of our cropping period. How would we get along without DDT, BHC, Zinc salts like Zineb and all the rest of these aids to cropping? Modern fungicides and insecticides, if applied judiciously, should keep the mushroom farm reasonably free from most of the troubles that we were really up against twenty years ago.

When a crop has been produced the battle is not over. It must be gathered and packed in the most efficient way possible. Here, I am afraid, I am going to tread on some toes. Unless where pre-packaging or elaborate washing and drying methods are practised a packing shed is quite unnecessary and the picking, grading and packing of the mushrooms should be done inside the growing house. Just because field crops are usually packed in a central packing shed some mushroom growers think that the same should apply to mushrooms. But this is not so; with field crops the greatest snag with which the packer has to contend is the weather, whereas in a mushroom cropping house the weather is always temperate and dry. Too often a packing shed becomes a sort of glorified rest centre where the boss can escape from the scene of the battle and be tempted by sugary cups of tea and idle chatter. The Commander who gets things done stays near the front with his troops. The bulk of the employees should be in the mushroom house and that is where the boss should be also most of his time. If grading is done during picking it takes remarkably little room at the end of a mushroom house to do the weighing and tying up. The fewer handlings that mushrooms get the better they will look eventually in the shop window. Too many growers save labour and expense on the growing of their crops only to throw it away on too elaborate methods of grading and packing.

Most growers look for a simple yardstick by which they can tell whether their farms are paying or not. Vegetable growers reckon that if not more than half their weekly takings are used up on wages then they should be all right. Some mushroom growers reckon that it takes the first pound to the square foot to pay all expenses and that anything over and above that is profit. My guide is that half of one's labour force should be spent on mushroom picking and packing. Time costs money and if less than fifty per cent of it is spent on the actual gathering of the crop then there is something wrong somewhere. Crops are either too small or workers are taking too long on the processes of composting, casing preparation, trashing or other jobs.

To-day mushroom growing has reached a stage when any grower can grow a crop of mushrooms with a reasonable assurance of success. Gone are the days of wishful thinking and hoping. We are now an established industry and no other horticultural crop lends itself so well to factory-like methods.

What effect will this rapidly improving machine have on the future of mushroom growing? Are we going to be able to continue making a living out of mushrooms? These are questions that are frequently asked. Personally I am very hopeful and I have never been regarded as much of an optimist. Considering that our annual consumption of mushrooms is still under one pound per person compared to two-and-a-half pounds in France surely there is still tremendous scope. The fact that most of the expansion of recent years was made by existing growers is surely proof that the majority of growers feel that there must be room for more mushrooms. We cannot expect any great rise in the average price per pound of mushrooms and we should try and adjust our methods to enable them to be retailed at a shilling a quarter in the summer and one and three pence in the winter. At these prices the public will buy. A period of artificially high prices can be a bad thing in the long run as good customers can be put off and forget to start again. Some smallish growers claim that they can no longer make a living out of mushrooms, but the average mushroom grower's idea of what a ' living ' is can be completely different from that of other horticulturists. Many of the latter do not have easy livings and they put much more personal effort into their jobs than some small mushroom growers do.

The small grower is on the best possible wicket for producing best quality mushrooms and quality is the most important factor in increasing sales. Lots of potential sales are lost through poor quality. In this connection there is surely a great future in the use of appropriate cooling plants for the removal of field heat from mushrooms immediately after picking. We should aim at producing larger mushrooms because they not only cut down the amount of work to be done by the grower but they make the job of preparation much easier for the housewife. It is a sorry sight to see some of the dirty little glorified pinheads that are offered for sale in certain areas. As an indication of the expansion potential which can exist I know of one case where

a firm concentrated on a particular city and over a period of twelve years increased its weekly sales there from two or three dozen to approaching two thousand chips. Over three million publicity bags, a high percentage of the total for the country, were distributed in this city.

In the future we have got to look more and more to publicity and our present efforts, commendable though they may be, will have to be extended annually.

Pre-packaging has surely a tremendous role to play in increasing sales and its use in self-service stores, butchers' shops and similar places will undoubtedly increase in the years to come.

I would forecast that the next decade or so will see a still greater simplification of growing and synthetic composts will become less elaborate and more dependable. A search will have to begin for other raw materials because sooner or later the great limiting factor to mushroom growing will be the country's straw supply. It takes two acres of ground to supply the straw required for one thousand square feet of mushroom bed. So if our present production is in the region of 25,000,000 square feet per annum then this requires 50,000 acres of straw. The annual consumption of straw by the mushroom industry is rapidly approaching 100,000 tons and it is doubtful whether farmers will have that quantity surplus to their own requirements. Unless other raw materials (such as bracken and hay which have already shown some success) can be found the ultimate brake on expansion will be the supply of material for making a good compost. There is enormous scope for research not only in this field but many others. How grateful we would be if we only knew the exact conditions which stimulate the mycelium to produce mushrooms at the surface of the casing layer.

We are an expanding industry and nothing that anyone can do will stop it expanding. By higher yields and lower production costs there will continue to be a reasonable profit. An industry that can double its production in ten years and still get rid of its produce at any price has surely hope for the future.

In conclusion I would say that we must keep on tackling the problems that look difficult and continue to try solving the things that appear impossible.

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CONGRATULATIONS TO HENRY HAYNES

Members of the MGA will join together in congratulating Mr. Henry Haynes on his appointment as Deputy General Secretary of the National Farmers' Union. Mr. G. F. Elston, head of the cereals and potatoes divisions, has also been similarly promoted. Both were previously senior NFU Secretaries.

Always a keen supporter of the MGA Mr. Haynes, who has been with the NFU for 22 years, attended an initial meeting at The Angel Hotel, Peterborough, in 1945 prior to the formation of the MGA. Since that time his active interest in the welfare of the Association has never wavered.

Mr. Haynes, who is 46 and lives at Takeley in Essex, has been head of the horticultural department at the NFU since 1940 and honorary general secretary of the NFU Market Produce Show Society since 1948. His award of the M.B.E. last year was widely acclaimed.

LOCAL PUBLICITY

Mr. N. R. Cooper, member of the MGA Executive Committee, the Publicity Committee and Secretary of his Area Committee, held a farm walk and cookery demonstration at his farm at Kimcote, Rugby, on 16th May, when catering managers and others connected with industrial catering, including some associated with many of the larger manufacturing concerns in the Midlands, were present.

It was an initial enquiry from the English Electric Co's. catering manager at Rugby which led to the walk and demonstration. After a talk by Mr. Cooper emphasising the care which had to be taken with mushroom growing, the party went to the English Electric Co's. canteen at Rugby where the Company provided an excellent buffet meal. Afterwards Mrs. Valerie March, Cookery Adviser to the MGA, demonstrated the uses of mushrooms, both in the home and in industry. As the daughter of a mushroom grower she was able to enliven her demonstration with many details concerning the life of the mushroom. She proved a first-class demonstrator.

Later Mr. Cooper and Mrs. March answered a number of questions, the audience proving exceedingly lively. Area C Chairman, Mr. F. C. Atkins was present with Mrs. Atkins.

Mr. Cooper writes :— " There is no doubt that the whole operation was very successful, showing as it did the mushroom from beginning to end. Through the industrial use of mushrooms tens of thousands of people will have the opportunity of eating them though they may never have previously bought them, and I would urge further investigation into the possibilities of arranging more such meetings."

MUSHROOM GROWING AT OVING

See how they grow.

The increasing production of mushrooms by the spawn makers and spawn merchants in the United Kingdom has always been the subject of speculation amongst growers in general, and certainly one spawn distributor, Mr. S. A. F. Sampson of Oving, near Chichester in Sussex has suddenly, over the last year or two, become the second largest producer in England, turning out in the last few weeks an average of more than 30,000 lb. of mushrooms from his 188,000 sq. ft. basic bed area on the tray system. The weekly filling rate is 16,000 sq. ft.

Mr. Sampson, trading as S. A. F. Sampson Ltd. in the matter of Sinden spawn, and Sampson's Mushrooms Ltd. in the field of mushroom production, confesses to having had a tremendous battle in the early fifties with La France disease, which he overcame. He has gone from strength to strength and his present production of over 10 lb. per sq. ft. per year in just over five crops on four inches of compost is among the best production records in the country, even allowing for the inclusion of stalks, the deduction of which amounts to about 10% of the total weight. These production figures represent about 400 lb. of mushrooms per ton of fresh manure.

There is nothing whatever secret about production at Oving and nothing at all extra goes into the all-important compost, based on a good quality horse manure, composted in seven to eight days, with 5% to 10% of chicken manure added, plus gypsum.

Whenever and wherever mushroom growers forgather speculation is rife as to what the " big boys " add to their compost, but, says Mr. Sampson, " as far as I am concerned nothing extra goes in. I follow the Sinden method of short composting, as laid down in ' Mushroom Science 2' and I stick to it." What he didn't add is that he was about the first grower in this country or certainly one of the first, to master short composting.

For composting Mr. Sampson uses a Swedish machine, single-elevator version of the type seen by visitors to the Fammarps establishment on the occasion of the 4th International Conference. This machine is capable of turning about 20 tons of compost an hour with three to four men in attendance.

Mr. Sampson prefers two men working behind the machine, stacking and consolidating to get the temperature up to 170° F. After the seven day composting cycle the compost spends up to four days in the pasteurising room going through the 2nd phase at temperatures between 130° F. and 140° F. Spawning is carried out by the Sinden-Hauser spawning machine, mixed spawning is practised and, after 10 days in the growing rooms, the casing operation takes place, again using the spawning machine.

Peat and chalk are used for casing in equal parts by volume, the chalk being $\frac{1}{4}$ inch to dust. Growing temperature is 60° F.

Prior to the casing, the peat is soaked in concrete water tanks, remaining hessian covered until completely saturated.

The mixing of the peat and chalk is carried out by using a simple

At work with the Hauser-Sinden spawning machine, complete with press. The trays are being emptied, prior to spawning, at the far end.

TOP: An inside view of one of the 4,500 sq. ft. converted glasshouses on the Greenacres nursery. Mr. Sampson is on the right.
BOTTOM: A general view of the compost yard, with a rear view of the Swedish turner on the left of the picture.

but very effective worm conveyor machine, invented by Mr. Sampson and now patented. The chalk and peat are fed into hoppered worm conveyors running horizontally to the ground. Either worm is variable in speed and the amount of the mix can be controlled at will. Both horizontal worms work inwards, the peat and chalk meeting in the centre. From that point a vertically operating worm carries the peat and chalk up a central elevator, mixing as it goes. Servicing the trays by this means becomes a simple but efficient operation.

These hollow clay pots are a feature of the growing house construction at Rushmans.

At Rushmans, the home farm, Mr. Sampson has about 100,000 basic sq. ft. in houses each holding 4,500 sq. ft. of bed area. The walls are of hollow clay pots, a 2 inch still air cavity and solid concrete blocks, as illustrated, and heating is carried out by a series of $1\frac{1}{2}$ inch hot water pipes, grouped together immediately under the air ducting in the centre of the roof, the warm air being distributed in this way. "I'm told this is all wrong but it works and I don't propose to change it yet anyway" said Mr. Sampson, commenting on this heat distribution method.

The trays, measuring $3' \times 2'$ inside, are purpose-built mostly of Portuguese pine which Mr. Sampson finds quite satisfactory. Heating of the farm is by oil-fired boilers and Mr. Sampson was one of the first to join in the MGA Bulk Oil Scheme.

At the neighbouring nursery of Greenacres, which Mr. Sampson took over about a year ago, growing is in converted glass-houses, again in 4,500 sq. ft. units. Because the glass was in 24″ panes, special care had to be taken when installing the necessary insulation. Hard paper, backed by glass-wool and covered with light reflecting roofing felt, supported by battens over the glass, has proved to be highly satisfactory.

Compost used at Greenacres is made at Rushmans and the picking staff alternates between the two farms.

As on so many of the larger farms, picking is something of a problem and Mr. Sampson pays his women pickers at the rate of 3/6d. an hour which is the equivalent, by his method, of each picker averaging 24 lb. per hour. The actual average is 18 lb. A bonus of $1\frac{3}{4}$d. per lb. is paid for each lb. picked above 24. The star picker at Rushmans once averaged 60 lb. an hour for a day and 50 lb. for a complete week. Special training in picking is now improving the picking rate.

When I visited Oving there were plenty of mushrooms about on both farms and everyone was hard at it. Tray filling was in operation and Mr. Sampson pointed out that the trays were being correctly filled

in the corners. " It is things like this which make a considerable difference " he said, and to illustrate his point he said that an increased production of only 0.1 of a lb. per sq. ft. per year would, if mushrooms averaged 3/- per lb., increase the gross turnover by £12,000. If the picking rate could be increased so that the average pick per hour per head was, in fact, that 24 lb., then there would be an overall saving in costs of about £5,000 per year, and 1d. per lb. on mushrooms produced would result in an extra gross income also of around £7,000. These figures make it only too clearly apparent that great attention is required to detail.

I was able to have a look at the production and complete records dealing with the Rushmans part of the undertaking back to early 1953— Mr. Sampson has been growing for 12 years in all. Thus, in 1955 (July to December) when the basic area was a mere 15,000 sq. ft. these records clearly showed the ruinous effect of the La France attack for, during that period, crop average, with stalks, was down to a $\frac{1}{4}$ lb. Early in 1956 showed the pulling out of the trouble when crops, for that year, had averaged 1.28, climbing back to 2 lb. by the end of the year. In 1957 the crop average went up to $2\frac{1}{2}$ lb. per sq. ft. but in the middle of 1958 a clear drop was indicated on a succession of 16 crops to under 2 lb, casing too early being credited as causing the trouble. On another occasion the records showed quite clearly a steady rise in " seconds " which, on investigation was traced to the fact that the amount of parzate dust used had been altered—it was quickly remedied. Price returns last year averaged 2/11$\frac{1}{2}$d. excluding stalks and with the salesmen's commission already deducted. The presence of stalks lower the average per lb. by about 2d. Ungraded mushrooms, " seconds " or roughs if you like, averaged only half the return of the top grade, hence the quick return to the use of parzate.

Fork-lift motorised trucks are in constant use on both farms and, apart from carting the trays backwards and forwards, from the compost yard to the spawning and casing shed, in and out of the peak heat rooms etc., one comes in extremely useful in pallet loading the large, specially constructed refrigerated lorry which goes to market (London) every day. Somewhat surprising therefore was the fact that the trays are filled manually with forks. " It's cheaper and more efficient that way " Mr. Sampson feels, after trying other methods.

Farm walks? " A Grower who has a farm walk on his farm is, to my mind, quite a hero ", comments Mr. Sampson.

There is nothing unorthodox in production methods on either farm. Between three and five air changes take place per hour in each growing house, there is no cramming of trays in growing houses and the watering of the beds is pretty free and seems heavier than on most farms.

Perhaps it was the extra water which produced 35,301 lb. of mushrooms in the first week in May, and 36,666 lb., 35,399 lb., and 36,075 lb. in the three previous successive weeks. Spawning rate? 12 to 18 sq. ft. to each 22 oz. carton of grain spawn.

Finally, Mr. Sampson had a little to say about the difficulties which can be encountered with the planning authorities regarding the con-

Top: An outside view of Greenacres.
Bottom: The Sampson refrigerated pantechnicon being loaded for direct delivery to the London markets.

struction of new buildings. " I like the hollow clay blocks I use to help with insulation and would have liked to have used them on all my growing sheds in particular but the planning people just wouldn't let me " he said, adding " apparently they regard them as a little unsightly on outside walls." Did I think the clay pots unsightly? I most certainly didn't and would be quite delighted to have my own house built of them. Mr. Sampson and I were agreed on one thing: It is a most peculiar world in which we live.

WRA

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Although Western standards are now somewhat higher than this, some of the older growers may detect something familiar about this picture of growing in Formosa. It is interesting to note the varying use to which bamboo is put.

From the United States Information Service in London, comes news that farmers in Taiwan (Formosa) have launched into mushroom growing, a million-dollar business which may make the island one of the world's major producers of mushrooms.

Since, says the hand-out, no Chinese-style dinner would be complete without mushrooms, mushrooms have always been produced there but these were not up to international standards, either in colour or taste. Frequently too, a good crop was spoilt by bad transport arrangements, the markets being some distance away. The problems encountered in canning gave little assurance that the consumer would find anything more than a can of black-coloured, inferior mushrooms.

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Tel.: Bracknell 1341

Working in Formosa is an organisation known as the Joint Commission on Rural Reconstruction and it was this organisation which produced a specialist in mushroom growing and canning to examine the problem. He quickly pin-pointed transport, inadequate canning techniques and improper methods of cultivation, as the main obstacles in the way of expanding the industry, and the Joint Commission, with the help of other interested organisations, provided the initial $10,000 which was needed to provide sufficient experts to overcome the obstacles mentioned. It was the Joint Commission too which set up 17 collection centres in 13 counties in central Formosa.

At first the farmers were taught how to construct an initial bed of 36 sq. ft. on the shelf system and subsequently, in houses constructed of thatch and bamboo, with the shelves also supported by bamboo and arranged in tiers, growing houses, making the best use of the available space, came into being.

To judge by this picture, the mushrooms are of pretty good quality.

It is an important part of the programme that the grower is guaranteed a fixed price for his mushrooms and, through the offices of the Joint Commission, he is kept fully informed of the latest developments in the mushroom growing industry.

As mushrooms in the island are grown during the October-April period the canning factories, previously engaged mainly with pineapples, which meant that the equipment stood idle during certain periods of the year, are now able to keep operating without a break.

Although at the moment, only a few Taiwan farmers are engaged in the mushroom growing industry it is estimated that a total bed space of 3,600,000 sq. ft. is currently in production and 100,000 cases of canned mushrooms are expected to be available for export this year. This level of production means a turnover this year from an infant industry of about 1,300,000 U.S. dollars.

WATCH THAT PEAT

Research Institute Spotlights Danger

Quite a good sprinkling of mushroom growers attended the Open Day on 25th May at the Glasshouse Crops Research Institute, Littlehampton when, following an excellent lunch, visitors toured the centre and inspected the work being carried on.

All growers are aware that eelworms are commonly found in mushroom compost, more particularly towards the end of cropping. A report by the Institute on this subject says:— We are studying the various eelworms present and investigating the sources from which they might come. Eelworms abound in manure and straw during composting, but it is now general to peak-heat compost before spawning and this should kill most of them. Some may, however, survive, breeding rapidly in the pasteurised compost, restricting mycelial growth and reducing yield.

Peat used in casing may also be a source of eelworms. Several samples of peat have been examined and have yielded species which are known to feed on mushroom mycelium. Their numbers are frequently low, some samples yielding less than ten eelworms per pound of wet peat. This may, however, be misleading as eelworms can breed at a rapid rate, one mating pair producing over 72,000 descendents in four weeks.

Another aspect of eelworm biology which is being studied is the persistence of some species under adverse conditions. We have found that one particularly destructive species will survive in water without food for more than ten weeks. Most eelworms are dependent on moisture for survival and die if they dry out. This particular species can withstand drying for at least six weeks. It becomes active again on rewetting and will readily attack mushroom mycelium. Its ability to survive drying makes it a particularly dangerous species as it could easily be spread by being blown around on dried compost or peat.

Effect of environment on mushroom growth.

Preliminary results are now coming from the unit set up to study the effects of physical environment on mushroom growth. This unit consists of eight chambers in each of which the temperature, relative humidity and ventilation rate can be independently controlled.

Four experiments have now been completed and a fifth is in progress. The first experiments have shown that it is possible to obtain good yields in the chambers—up to 2 lb. per sq. ft. in four weeks. Results so far show that the yield is very much lower when the crop is grown at 70° F. compared with 65° F. Thus low yields which are obtained by growers in a hot summer and often attributed to poor ventilation may be the result of high temperatures.

Low humidity in the region of 50% has a very marked injurious effect on cropping. Increasing the rate of ventilation improved cropping. There was little difference between ventilation rates of 5 and 10 cu. ft. per sq. ft. per hour, but marked differences between 1 and 10 cu. ft. per hour.

It is hoped to increase the number of chambers to sixteen and to continuously record temperature and humidity in each chamber.

Growers who are interested in membership of the Institute should write direct to : **The Secretary, Glasshouse Crops Research Institute, Worthing Road, Rustington, Littlehampton, Sussex.**

Calypso

PROSPECTIVE GROWERS' GUIDE

If I were a beginner at the Mush'
I should achieve perpetual steady flush,
And constant work for pickers filling punnets,
By building multiples of growing units ;
In feet each unit would be thirty wide,
And *temp-o-rar-y* length I could decide,
As dictates cash-in-hand, my bank balance,
And what my manager might well advance!
Sev'n rooms each thirty wide and twenty ' long '
Would make me seven thousand square feet strong,
Until some future date a long way off,
More roofs I'd don, while dummy ends I'd doff,
To add another twenty feet to length
Till fourteen thousand feet would be my strength ;
And then, in distant years, again I'd double,
Extending each with minimum of trouble.
Behold my ace's strength (I now unmask it),
Is trump, as eggs avoid a single basket,
And from the start I stimulate a pure
Full-fledg-ed mushroom man in miniature,
And also have each year, instead of four,
Some thirty crops and learn a whole lot more!
Now wisely let's rehearse the basic drill—
The aim would be, at start, ' fortnightly fill ',
Or, better still, I'd aim to build fourteen
And so provide each week a set routine!
That's how I'd plan and lay my little plot
If I were a beginner—but—I'm not!

F.P. (BELFAST)

A GERMAN VIEW OF THE COMMON MARKET

Erich Hullen

President of the Bundes der Champignonzuchter Deutschlands

The Common Market is the existing community of six European countries (France, Italy, Holland, Belgium, Luxemburg, and West Germany) which, it is hoped, will be joined by other European countries such as England and eventually the whole of EFTA*. The aims of the C.M. are : the removal of trade restrictions and the abolition of tariffs within the community. A further long-term aim is the establishment of equality of competition, thus making fair competition possible. Moreover, there are already discussions in hand within the Common Market which aim at harmonizing the standards of food supply, at introducing common standards of quality and at fixing, obligatorily, the practices and conditions of trade and business. A harmonization of social policies is also sought. The common external tariff of the C.M. is to be eventually established in accordance with the GATT, on the basis of Article XXIV of the GATT† Statute.

In the dismantling of tariffs within the C.M. the starting point was the level of tariffs in force on 1.1.57 ; a distinction was made between industrial and agricultural products and also between liberalised agricultural products and those subject to quotas. Here it should be mentioned that in the meantime –on 12.5.60—the so-called Hallstein Plan provided for an acceleration of the progress in achieving the aims of the treaty (abolition of quantitive restrictions and internal duties).

According to this plan an internal tariff and quota-free common market for fruit, vegetables and processed products is to be realised on 1st January, 1967.

The present situation is as follows :—

(*a*) For industrial products, *w.e.f.* 1.1.61, only 70 per cent. of the tariffs operating on 1.1.57 have been in force.

(*b*) For agricultural products, certain exceptions obtain, according to paragraph 2 of Article 38 of the Treaty, viz : For non-liberalised the figure is 75 per cent. For liberalised agricultural products it is 80 per cent.

Mushrooms : In the case of mushrooms the position in Germany was as follows :— On 1.1.57 the import duty of fresh mushrooms was 30 per cent. At that time the import duty on preserved mushrooms was 25 per cent. As imports of mushrooms are now totally liberalised the import duty from 1.1.61 has been, for fresh mushrooms, 24 per cent., for preserved mushrooms, 20 per cent.

For third countries however, in accordance with the GATT, the duty is, for fresh mushrooms, 27 per cent., for preserved mushrooms, 23 per cent.**

* European Free Trade Area. † General Agreement on Tariffs and Trade.

** In Gt. Britain, the import duty on fresh mushrooms is 10% in summer and 20% in winter.

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It is obvious from this that regard is being paid to agriculture, which is not of course to deny that agriculture is nevertheless having a bad time.

The greatest blow for us mushroom growers in West Germany was the lifting of quantitative restrictions on imports of mushrooms from 1st July, 1959, in accordance with the GATT. Furthermore, we had in effect an additional tariff reduction of 5 per cent. through the revaluation of the Dm. in 1960, consequently we have to reckon with heavy imports of competitive products.

We welcome the aims of the C.M. but we would like to point out that the agricultural concerns in West Germany, including us mushroom growers, do not have an easy time. Germany is, principally, an industrial state with high incomes and high wages ; the consumption of good quality fruit and vegetables is consequently very high. This is well-known, so everything flows towards Germany.

France, Italy and Holland are agricultural countries with highly favourable climatic conditions and they can have available earlier than us, the early-season fruit and vegetables and can sell them in Germany at prices which, we feel, are too low.

For mushroom growing the same applies. We have a continental climate, with severe cold in winter and intense heat in summer. Western France, Holland and, farther away, England also, have maritime climates, and the moist air and not too high temperatures are to the advantage of above-ground mushroom cultivation.

As already mentioned, we do not wish to abandon the C.M., but we must oppose its disadvantages. We can best do this by improving the climatic factor of our mushroom growing sheds and by improving our cultivation methods and so increasing our yields. We rely on science to achieve this for us.

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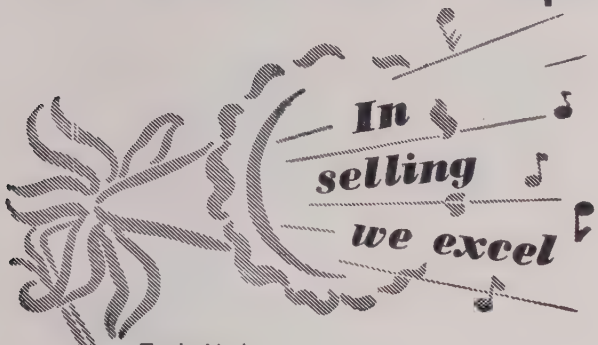

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